

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 99/00715

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G06K 9/20, H04N 1/00, G03B 17/48

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G06K, H04N, G03B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| X | WO 9737320 A1 (METANETICS CORPORATION), 9 October 1997 (09.10.97), page 5, line 19 - page 6, line 9; page 7, line 16 - page 8, line 3; page 9, line 5 - line 21, figures 21-24 | 1-4,7,11-16 |
| Y | | 5,6 |
| A | | 8-10 |
| | -- | |
| Y | WO 9314470 A1 (NORAND CORPORATION), 22 July 1993 (22.07.93), abstract | 5,6 |
| | -- | |
| A | WO 9632692 A1 (UNITED PARCEL SERVICE OF AMERICA INC.), 17 October 1996 (17.10.96), abstract | 12 |
| | -- | |



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

22 July 1999

Date of mailing of the international search report

12 -08- 1999

Name and mailing address of the ISA/

Swedish Patent Office

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/SE 99/00715

| Patent document cited in search report | | | Publication date | Patent family member(s) | | Publication date |
|---|---------|----|---------------------|----------------------------|------------|---------------------|
| WO | 9737320 | A1 | 09/10/97 | AU | 2550997 A | 22/10/97 |
| | | | | US | 5793033 A | 11/08/98 |
| | | | | US | 5834754 A | 10/11/98 |
| WO | 9314470 | A1 | 22/07/93 | CA | 2121464 A | 22/07/93 |
| | | | | EP | 0621970 A | 02/11/94 |
| | | | | US | 5345088 A | 06/09/94 |
| | | | | US | 5811828 A | 22/09/98 |
| WO | 9632692 | A1 | 17/10/96 | CA | 2217369 A | 17/10/96 |
| | | | | CA | 2217458 A | 17/10/96 |
| | | | | EP | 0820617 A | 28/01/98 |
| | | | | EP | 0820618 A | 28/01/98 |
| | | | | JP | 11501572 T | 09/02/99 |
| | | | | JP | 11502348 T | 23/02/99 |
| | | | | US | 5642442 A | 24/06/97 |
| | | | | WO | 9632690 A | 17/10/96 |

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| | | |
|---|---|---|
| Applicant's or agent's file reference 2990828 | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/SE99/00715 | International filing date (<i>day/month/year</i>) 30.04.1999 | Priority date (<i>day/month/year</i>) 30.04.1998 |
| International Patent Classification (IPC) or national classification and IPC ₇ G 06 K 9/20, H 04 N 1/00, G 03 B 17/48 | | |
| Applicant C TECHNOLOGIES AB et al | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

| | |
|--|--|
| Date of submission of the demand 21.10.1999 | Date of completion of this report 12.09.2000 |
| Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88 | Authorized officer Patrik Blidefalk/Els Telephone No. 08-782 25 00 |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE99/00715

I. Basis of the report

1. This report has been drawn on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*:

☒ the international application as originally filed.

☐ the description, pages _____, as originally filed,
 pages _____, filed with the demand,
 pages _____, filed with the letter of _____,
 pages _____, filed with the letter of _____.

☐ the claims, Nos. _____, as originally filed,
 Nos. _____, as amended under Article 19,
 Nos. _____, filed with the demand,
 Nos. _____, filed with the letter of _____,
 Nos. _____, filed with the letter of _____.

☐ the drawings, sheets/fig _____, as originally filed,
 sheets/fig _____, filed with the demand
 sheets/fig _____, filed with the letter of _____,
 sheets/fig _____, filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/fig _____

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the supplemental Box (Rule 70.2(c)).

4. Additional observations, if necessary:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE99/00715

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

| | | | |
|-------------------------------|--------|-------------------|-----|
| Novelty (N) | Claims | <u>2-10</u> | YES |
| | Claims | <u>1, 11-16</u> | NO |
| Inventive step (IS) | Claims | <u>8-10</u> | YES |
| | Claims | <u>1-7, 11-16</u> | NO |
| Industrial applicability (IA) | Claims | <u>1-16</u> | YES |
| | Claims | | NO |

2. Citations and explanations**Invention and background**

The claimed invention relates to a device for reading information in two different modes, particularly character and image reading. Inputting information in hand-held portable computers is time consuming.

The invented solution consists of a portable hand-held scanner, which reads images in an image reading mode and text in a text reading mode. This requires a way to putting together image and text information

Prior art

The prior art, cited in the search report, consists of the following documents:

- (D1) WO 97/37320, A1
- (D2) WO 93/14470, A1
- (D3) WO 96/32692, A1

D1 describes a bar code reader, which also reads images. The apparatus reads an area in two modes (bar-code or image) for treating and storing the read data in different ways, depending on the mode. The apparatus also has a display for displaying the image to a person and transmitting device for transmitting the read information. (See page 5, line 19 - page 6, line 9; page 7, line 16 - page 8, line 3; page 9, line 5-21; page 33, line 4 - page 34, line 16, figures 18, 21 - 24).

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

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Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: V

D2 describes an optical reader for reading optical information on different distances (See abstract).

D3 describes a character recognition system. However, it does not describe the claimed invention, it just defines prior art.

Statement of reasons

The image-recording device of claim 1 and 11-16 does not differ from the image-recording device described in D1; therefore the invention claimed in claims 1,11-16 is not novel. Claims 2-4 and 7 describe constructional details as; storing character-coded information instead of bar-coded information; and that the device uses one or two sensors. However these additional details are well known in the art and do not give rise to any unexpected technical effect. It must therefore be considered obvious, for a person skilled in the art, to include these details in the device disclosed in D1. Thus, the invention of claims 2-4 and 7 is not considered to involve an inventive step.

A person skilled in the art has to solve the problem of providing two different focuses or a variable focus. Document D2 discloses how to construct an image-recording device with variable focuses. Further, it is considered obvious to a person skilled in the art to modify the prior art technique, according to what is known from D2 and arrive at the invention, claimed in claim 5 and 6. Because the known technique considers the same technical area (portable image-recording devices) and solves the problem with the same means as the claimed invention, it is obvious to a person skilled in the art to adapt what is known from D2 to construct a image recording device, as claimed. Therefore, the invention of claims 5 and 6 does not comprise an inventive step.

Accordingly, claims 1 and 11-16 are not novel (N), and claims 1-7 and claims 11-16 do not comprise an inventive step (IS). Claims 1-16 fulfils the requirement of Industrial Applicability (IA).



11-11-11
11-11-11
11-11-11

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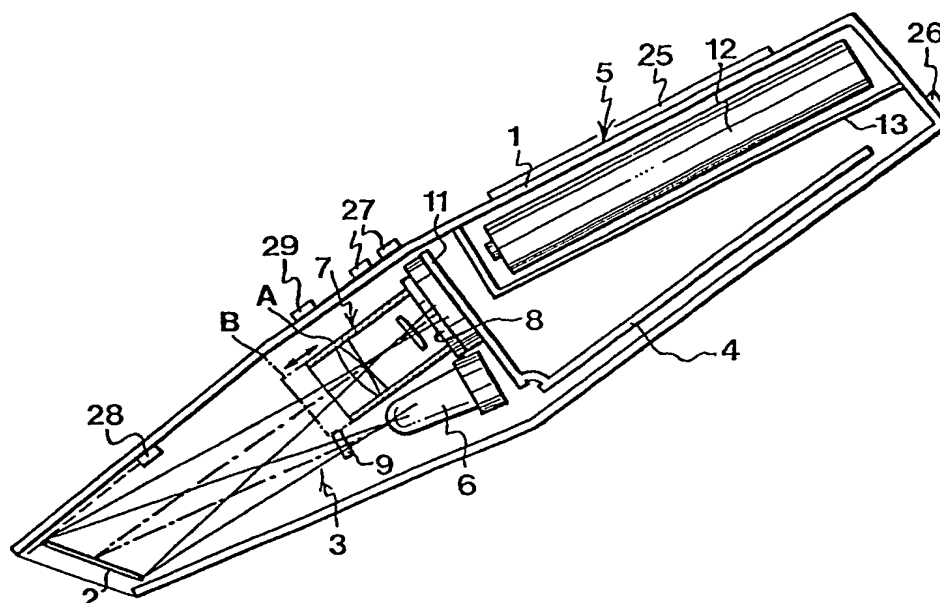
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

| | | | |
|--|--|--|--|
| (51) International Patent Classification ⁶ : G06K 9/20, H04N 1/00, G03B 17/48 | | A1 | (11) International Publication Number: WO 99/60515 |
| | | | (43) International Publication Date: 25 November 1999 (25.11.99) |
| (21) International Application Number: PCT/SE99/00715 (22) International Filing Date: 30 April 1999 (30.04.99) (30) Priority Data: 9801520-9 30 April 1998 (30.04.98) SE 60/091,320 30 June 1998 (30.06.98) US (71) Applicant (for all designated States except US): C TECHNOLOGIES AB [SE/SE]; Forskningsbyn Ideon, S-223 70 Lund (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): FÅHRAEUS, Christer [SE/SE]; Sölvegatan 3, S-223 62 Lund (SE). (74) Agent: AWAPATENT AB; P.O. Box 5117, S-200 17 Malmö (SE). | | (81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published With international search report. In English translation (filed in Swedish). | |

(54) Title: DEVICE FOR RECORDING INFORMATION IN DIFFERENT MODES



(57) Abstract

A device for recording information has at least one light-sensitive sensor (8) with a two-dimensional sensor surface. The device is adjustable between a first mode and a second mode. In the first mode, the device is adapted to essentially abut against and be passed over a surface for imaging the same by means of a plurality of images. In the second mode, the device is adapted to image an object located at a distance.

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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|-----------|---|-----------------------|
| X | WO 9737320 A1 (METANETICS CORPORATION), 9 October 1997 (09.10.97), page 5, line 19 - page 6, line 9; page 7, line 16 - page 8, line 3; page 9, line 5 - line 21, figures 21-24 | 1-4,7,11-16 |
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| A | -- | 8-10 |
| Y | WO 9314470 A1 (NORAND CORPORATION), 22 July 1993 (22.07.93), abstract | 5,6 |
| A | WO 9632692 A1 (UNITED PARCEL SERVICE OF AMERICA INC.), 17 October 1996 (17.10.96), abstract | 12 |
| | -- | |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

22 July 1999

Date of mailing of the international search report

12 -08- 1999

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Malin Keijser/AE
Telephone No. +46 8 782 25 00



INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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| Patent document cited in search report | | | Publication date | Patent family member(s) | | Publication date |
|---|---------|----|---------------------|----------------------------|------------|---------------------|
| WO | 9737320 | A1 | 09/10/97 | AU | 2550997 A | 22/10/97 |
| | | | | US | 5793033 A | 11/08/98 |
| | | | | US | 5834754 A | 10/11/98 |
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| | | | | EP | 0820617 A | 28/01/98 |
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| | | | | US | 5642442 A | 24/06/97 |
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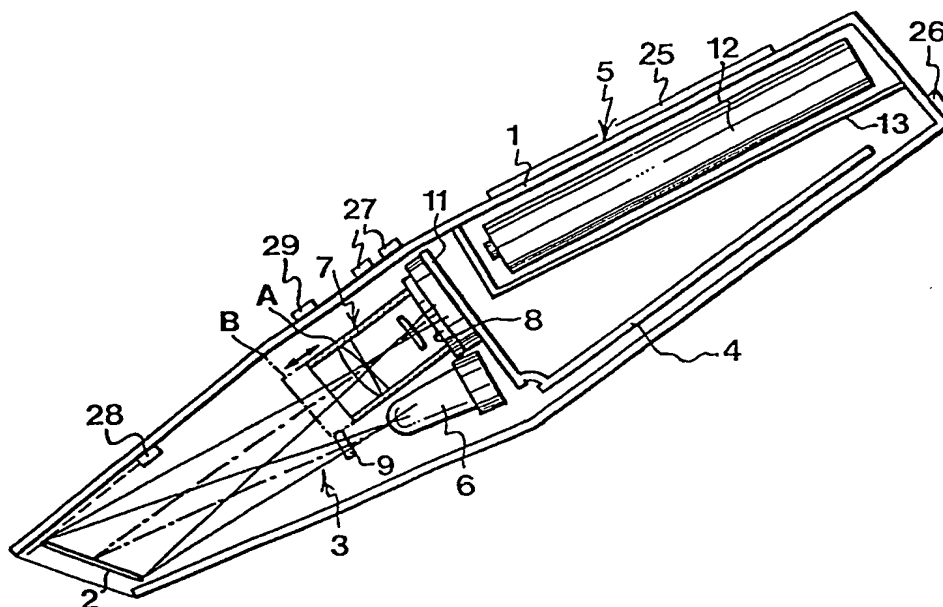
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422 Rec'd PCT/PTO 20 OCT 2000

DEVICE FOR RECORDING INFORMATION IN DIFFERENT MODESField of the Invention

The present invention relates to a device for recording information of the type mentioned in the preamble to the appended claim 1.

5 Background of the Invention

In recent years, the use of computers has increased among many very geographically mobile occupational groups. One reason for this is that one can work more efficiently by having direct access to a large amount
10 of information while at the same time having good capabilities for processing new information simply and efficiently.

For this purpose, various types of portable computers have been developed. Equipped with suitable software, these types of computers provide excellent capabilities for processing and managing information in text
15 as well as image format.

A drawback of these portable computers is that inputting information by the intermediary of a keyboard is often time-consuming in comparison with the
20 time required for processing the information once it has been fed into the computer. In order to achieve faster and more efficient inputting, there have been attempts at finding simpler ways of feeding the information into
25 the computer. In some cases, the text which is to be fed into the computer is replaced by a numerical code, for instance in the case of vehicle inspections. However, this requires more of the user, who has to keep track of several codes, which increases the risk of input errors.

30 In the daily work of many occupational groups there is a need for a simple way of putting together image and text information. Examples of this include various types of service and maintenance staff who work from some type of protocol and who wish to verify that a certain opera-

tion has been carried out; policemen at the site of an accident who wish to gather image data as well as personal data concerning witnesses, etc.; and researchers and other individuals whose work involves information retrieval and who wish to put together text and images from a number of different written documents.

In order to achieve more efficient inputting of information in these and similar situations one could use other input units, such as a scanner which records text information from a surface when it is passed over the same and a digital camera which takes pictures and stores them digitally so that they can be transferred to a computer for processing.

Scanners of both the stationary and the portable type are available. Stationary scanners are preferably used in connection with the recording of whole pages with printed text and image information, the scanner being passed over the page at a constant speed. The information is recorded by means of a light-sensitive sensor, which in stationary scanners often consists of a line sensor.

However, in most of the above situations, rather than the recording of a whole page of information a more selective recording of information is desired and, moreover, the scanner must also be easy to carry. For this reason, scanners of the hand-held type are much more interesting in these contexts. The sensors in these scanners can be either of the line type or of the two-dimensional type.

US 4,949,391, for example, discloses a hand-held scanner for recording text. The scanner has a two-dimensional sensor, which records images of the underlying surface when the scanner is passed over the same.

Another hand-held scanner is described in US 5,301,234. This scanner utilises a line sensor which records a sequence of vertical "slices" of the characters and of the spaces between them when the scanner is passed over the characters on the substrate. The "slices" are

stored in the scanner as a digital bitmap. To enable the accurate recording of characters, the scanner is provided with position means in the form of a wheel which must be in contact with the underlying surface in connection with the recording of the characters to record the position of the scanner relative to the surface.

A drawback of using a computer, a scanner, and a digital camera at the same time is that the equipment becomes bulky and the user has to handle several units.

Thus, there is a need for equipment which is easy to handle, enabling fast and reliable recording of selective text and image information in situations of the kind described above in a format facilitating computer processing of the same at a later time.

Summary of the Invention

The object of the present invention is to provide a solution to the above-mentioned problems by providing an improved device for recording information in text and image format.

This object is achieved according to the invention by a device having the features recited in the appended claim 1, with preferred embodiments in the appended claims 2-14.

The invention is based on the understanding that with a light-sensitive sensor with a two-dimensional sensor surface as the starting-point, a text recording function, i.e. a "scanner function", as well as an image recording function, i.e. a "camera function", can be easily created in one and the same device. More specifically, the device is adjustable between a first mode, in which the device is adapted to essentially abut against and be passed over a surface for imaging the same by means of a plurality of images, and a second mode, in which the device is adapted to image an object located at a distance.

The device can be adjusted by the user or automatically by the device if, for example, it detects that the

distance to an object within its field of vision changes more than a predetermined value. The adjustment involves the adaptation of the device in some manner, e.g. physically or with respect to software, to make it suitable
5 for use in the mode in question.

The first mode, or the "scanner mode", is intended for recording information located on a surface over which the device can be passed. The surface need not be plane. It is sufficient that it is even enough to enable the
10 device to be moved in contact with the surface or directly adjacent to the same. The information, which can be said to be "two-dimensional" since it is located on a surface, can be composed of character sequences, e.g. one or several words or one or several sentences selected
15 from a longer text. The characters can be letters, numbers, or other written characters or symbols. It is preferably stored in character-coded format. However, the information may also be composed of image information which is scanned by passing the device over the surface
20 and recording a plurality of images of the image information.

The second mode is preferably used for recording "three-dimensional" information, i.e. when one is required to take pictures of objects. Preferably, in this mode,
25 individual pictures are taken which are stored in image format. Naturally, this mode can also be used for taking pictures of surfaces from a distance, which are stored in image format.

Preferably, the same sensor is employed in both the
30 first and the second mode, but it is also possible to use one sensor for each mode. In the latter case, the adjustment would involve changing the beam path in the device so that the imaging takes place with the aid of one sensor in the first mode and with the aid of the other sensor
35 in the second mode. The beam path can be changed by adjusting one or more components in the device. Alternatively, a first opening with a first fixed beam path can

be used in the first mode, and a second opening with a second fixed beam path can be used in the second mode. Adjusting between the modes then comprises an adjustment of which sensor is activated for imaging.

5 It should be noted in this context that a two-dimensional sensor surface refers to the fact that the sensor surface must be able to image a surface with a matrix of pixels so that images with overlapping contents can be recorded.

10 Preferably, in the first mode, images with partially overlapping contents are recorded. The overlapping contents are used to put together the images to form a composite image, in which there is no duplication of content. Suitably, the putting-together is carried out with
15 the aid of a signal-processing unit which, for example, may contain software for this purpose. By virtue of the fact that the overlapping content is used for putting together the images, the device need not contain any means, e.g. wheels, for recording the position of the
20 device relative to the surface which is being imaged or for measuring the distance between the images. Moreover, the device can be moved at varying speeds while still permitting the images to be put together into a composite image.

25 The putting-together of the images is preferably carried out horizontally as well as vertically. This has the advantage that the device can be held at different angles and even be turned while being passed over the surface and yet the images can be put together well
30 enough that the characters in the composite image can be identified and OCR processed.

 The signal-processing unit preferably comprises software for identifying characters in the composite image and for storing the same in the device in character-coded format, preferably ASCII code. The character
35 identification is advantageously carried out with the aid of a neural network. Storing in character-coded format

requires considerably less memory space than if the same amount of information is stored, for example, as a bitmap image.

5 In order to project onto the sensor surface a clear image of the information to be recorded, i.e. the surface over which the device is passed in the first mode, or of the object located at a distance in the second mode, the device preferably comprises at least one lens means, which is adjustable between a first position in the first
10 mode and a second position in the second mode. In this way, two foci are provided for the device, i.e. two different imaging distances each providing a sharp image on the sensor surface. One focus is preferably used in the first mode where an object is located adjacent to the
15 device and the other is preferably used in the second mode where an object is located at a distance from the device. The second position can suitably allow imaging of objects at distances of between 0.5 m and infinity. The different foci enable imaging of surfaces or objects at
20 different distances from the device. The lens means may comprise one or more adjustable lenses. The device may contain one or more fixed lenses in addition to the one or more adjustable lenses. This embodiment is intended in the first place for the case where the device has a
25 single light-sensitive sensor which is common for both modes.

In another embodiment, the device comprises a lens means, the position of which is variable for providing a variable focus or an autofocus function. This enables
30 sharp imaging of an object located at an optional distance.

Furthermore, in an advantageous embodiment, the device is adapted to effect the imaging in the first mode with a lower resolution than the imaging in the second
35 mode. This can, for example, be achieved in the first mode by making passive some of the sensor elements of the sensor or by saving only a part of the sensor values

which are recorded by the sensor, or by using only a part of the saved sensor values in the subsequent processing of the images, such as in connection with the putting-together. The advantage of this embodiment is that it is possible to achieve faster, yet reliable, putting-together of the images in the first mode if their resolution is lower.

Moreover, the device advantageously comprises a transceiver for wireless communication with an external unit. In this way, information can be transferred between the device and, for example, an external computer. The transceiver can be an IR transceiver, a mobile radio transceiver, or some other suitable transceiver.

To make the device easy to handle in all types of recording situations it is suitably of the hand-held type. This also expands its field of application considerably.

In a preferred embodiment, the device also comprises identification means for identifying the extent of the imaging. The identification means may, for example, comprise a display mounted on the device, or one or several luminous spots projected from the device onto the object for defining the extent of the imaging. By the fact that the user gets an idea of what the image of the object will look like once it is recorded, the chances of obtaining an accurate imaging result will be substantially better.

Brief Description of the Drawings

The invention will be described in more detail below with reference to the accompanying schematic drawings showing, by way of example, a presently preferred embodiment of the invention.

Fig. 1 schematically shows a first embodiment of a device according to the invention;

Fig. 2 is a block diagram of the electronic circuitry in an embodiment of a device according to the invention;

Fig. 3 is a flowchart showing how the device is intended to function in the first mode;

Fig. 4 is a flowchart showing how the device is intended to function in the second mode;

5 Fig. 5 schematically shows a second embodiment of a device according to the invention.

Description of a Preferred Embodiment

Structure of the Device

10 In the embodiment of the device according to the invention shown in Fig. 1, it comprises a casing 1 having approximately the same shape as a conventional high-lighter pen. One short side of the casing has a window 2.

In the first mode of the device, the so-called scanning mode, the window 2 is intended to abut against or be
15 held directly adjacent to a surface which one wishes to image. This surface can, for example, consist of a sheet of paper from which text is to be recorded. In the second mode of the device, the so-called camera mode, the window is intended to be directed at an object which is located
20 at a distance and which one wishes to image.

The dimensions of the window 2 determine the size of the surface which can be imaged in the first mode. In the second mode, the dimensions of the window 2 only constitute a partial factor when determining which objects can
25 be recorded. Another partial factor of equal importance in the second mode is the distance to the object which the user wishes to image by means of the device.

The window 2 forms an acute angle to the longitudinal axis of the device so that in the first mode the user
30 is guided to hold the device at a predetermined angle to the underlying surface. Furthermore, the window 2 is somewhat recessed in the casing 1 so that it does not wear against the underlying surface when the device is used in the first mode.

35 The casing 1 essentially contains an optics part 3, an electronic circuitry part 4, and a power supply 5.

The optics part 3 comprises a light-emitting diode (LED) 6, an adjustable lens system 7, and a light-sensitive sensor 8 which constitutes the interface with the electronic circuitry part 4.

5 The LED 6 is preferably used in the first mode where its task is to illuminate the part of the surface which is currently located under the window. A diffuser 9 is mounted in front of the LED 6 for diffusing the light. In the second mode, the object being imaged is preferably
10 illuminated by means of other external light sources in the vicinity of the object.

 The task of the lens system 7 is to project as accurately as possible an image of the surface located under the window 2, or of the object located within the
15 field of vision of the window on the light-sensitive sensor 8. In connection with the adjustment between the two modes, the lens system 7 is moved between two positions so that two different foci are provided. Fig. 1 shows the lens system 7 in the first position A. The
20 second position B is indicated, by way of illustration, by dashes extending from the lens system. The lens system 7 can be moved in the same way as in a camera with two foci. Moreover, if required, the lens system 7 will reduce the image so that it will fit on the light-sensitive surface of the sensor 8.
25 sitive surface of the sensor 8.

 In this example, the light-sensitive sensor 8 comprises a two-dimensional, square CCD unit (CCD = charge coupled device) with a built-in A/D converter. Such sensors are commercially available. In this case, the sensor
30 8 is mounted at a small angle to the window 2 and on its own printed circuit board 11.

 The power supply to the device is obtained from a battery 12 which is mounted in a separate compartment 13 in the casing.

35 The block diagram in Fig. 2 schematically shows the electronic circuitry part 4. This comprises a processor 20, which by the intermediary of a bus 21 is connected

to a ROM 22, in which the programs of the processor are stored, to a read/write memory 23, which constitutes the working memory of the processor and in which the images from the sensor as well as the characters identified and interpreted in the first mode are stored, to a control logic unit 24, as well as to the sensor 8, the lens system 7, and the LED 6.

The control logic unit 24 is in turn connected to a number of peripheral units, comprising a display 25, which is mounted in the casing, an IR transceiver 26 for transferring information to/from an external computer, buttons 27, by means of which the user can control the device, a tracer LED 28 which emits a light beam, making it easier for the user to follow the text, as well as an indicating device 29, e.g. a couple of LEDs, indicating which mode the device is in and whether or not recording is taking place. Control signals to the memories, the sensor, and the peripheral units are generated in the control logic unit 24. The control logic also handles generation and prioritisation of interrupts to the processor. The buttons 27, the IR transceiver 26, the display 25 and the tracer LED 28, and the LED 6 are accessed by the processor writing and reading in the register in the control logic unit. The buttons 27 generate interrupts to the processor 20 when they are activated.

Operation of the Device in the First Mode

In the first mode, the device operates as follows. Suppose that a user wishes to record text from a sheet of paper. In this case, he holds the device against the sheet in the location where he wishes to start recording a character sequence. He presses a button 27 to activate the device and passes the latter over the text he wishes to record, following the text in the same way as when one reads the text. The tracer LED 28 emits a light beam which facilitates following the lines. When the user activates the device, the processor 20 commands the LED 6 to begin generating strobe pulses at a predetermined fre-

quency of 25 Hz, whereupon the sensor records images with partially overlapping contents which are stored in the read/write memory 23. However, text which is stored in the form of images requires a large amount of memory space. Consequently, to save memory space in this mode, the characters in the images are identified and stored with the aid of ASCII code. When the user has passed the device over the selected text or has come to the end of a line, he lifts the device off the sheet and releases the activating button, whereupon the processor 20 turns off the LED 6. When the selected text has been recorded, the user can control the device to show the recorded text on the display 25 or to transfer the text to an external computer by the intermediary of the IR transceiver 26. The possibility of showing the scanned information directly on the display has proven very important since a user often wishes to verify that the correct information has been scanned.

The flowchart in Fig. 3 shows how the device is adapted to work in the first mode. In step 301, images with overlapping contents are recorded with the aid of the above device and are stored in a current image area in the read/write memory 23. The images are stored as images, i.e. with the aid of a plurality of pixels, each having a grey scale value in a range from white to black.

As soon as an image has been stored in the current image area, the putting-together of the image with the previous image is suitably commenced, step 302, if such an image is available. If there is no previous image, the current image is entered directly into a line image area in the read/write memory.

In order to determine how the current image is to be put together with the previous image so that the best match is achieved between the contents of the images, every possible overlap position between the images is examined, at the pixel level, and an overlap measurement is determined as follows:

1) For each overlapping pixel position, the grey scale values of the two relevant pixels are added up if the latter are not white. Such a pixel position in which none of the pixels are white is designated a plus position.

2) The grey scale sums for all the plus positions are added up.

3) The neighbours of each pixel position are examined. If an overlapping pixel position is not a neighbour of a plus position and consists of a pixel which is white and a pixel position which is not white, the grey scale value of the non-white pixel is subtracted, possibly multiplied by a constant, from the sum in point 2).

4) The overlap position providing the highest overlap measurement as stated above is selected. In the resulting composite image the mean value of the grey scale value of the overlapping pixels is used. In this way, noise can be suppressed in the overlap area. The putting-together is thus carried out both vertically and horizontally. If it is detected that, when being put together, the images do not end up on a horizontal line, the composite image is suitably adjusted so that it becomes horizontal, for example by turning the composite image.

Our Swedish patent application No. 9704924-1 and the corresponding US Application No. 024 641, describe an alternative way of matching the images in order to find the best overlap position. The content of these applications is herewith incorporated by reference.

The composite image gradually develops in the line image area in the read/write memory. It is preferred that the line image area be big enough to store an A4 line of normal typewritten text.

In step 303, the software of the processor divides the composite image in the line image memory area into sub-images each containing only one character. The purpose of this is to create input signals to

a neural network software which is to interpret the characters. The division is effected by adding up the grey scale values of the pixels for each pixel row and each pixel column in the composite image. By studying the
5 local intensity minima for the row sums and column sums thus obtained, boundaries can be determined for the extent of each character in the image.

Subsequently, in step 304, each character in the composite image of the character sequence imaged is
10 interpreted. The grey scale values of the pixels which together constitute a sub-image containing only one character are fed as input signals to a neural network. Each output from the neural network represents a character which the network can identify. The output from the
15 network which has the highest output signal is chosen and the character thus chosen is stored in step 305 using a predetermined character code format, for example ASCII code, in the read/write memory 23 in a memory area for interpreted characters. When the character identification
20 and storing in character-coded format is completed, the processor activates the indicating device 29 to inform the user that it is ready to record a new character sequence, step 306. Subsequently, it goes back to step 301.

25 In the first mode, the steps described above are thus carried out by the processor 20 with the aid of the associated units and suitable software. Such software can be created by the skilled person with the aid of the above instructions. The character recognition is performed with the aid of neural network software, which is
30 adapted in a suitable manner. Neural network software is commercially available from, for example, MATLAB Neural Network Toolbox, The MathWorks Inc., 24 Prime Park Way, Natick, MA 01760, USA.

35 Adjustment of the Device between the two Modes

Suppose that the user now wishes to supplement the scanned text with an image of an object. In this case,

he indicates this by pressing the button 27. Then lens system is then moved to the position B. This movement results in the focus of the device being changed so that a clear image of an object located at a distance can be projected onto the light-sensitive surface of the sensor 8.

Operation of the Device in the Second Mode

In the second mode, the device operates as follows. The user directs the window of the device at the object which is located at a distance and which he wishes to image. On the display 25 of the device, the user can see the image which will be recorded. When the user is satisfied with the appearance of the image, he presses a button 27 to activate the device which then records an image of the object and stores the image in image format in the memory 22. When the image of the object has been recorded, the user can control the device to either show the recorded image on the display 25 or transfer the image to an external computer by the intermediary of the IR transceiver 26. The recorded image can then be supplemented with additional text information by the user setting the device to the first mode and recording text or other characters. Subsequently, the text and image information recorded can be shown either on the display 25 of the device or on an external computer.

The flowchart in Fig. 4 shows how the device is adapted to operate in the second mode. In step 401, the extent of the image is indicated on the display 25 of the device. When the user is satisfied with the appearance of the image, he presses the button 27 and, in step 402, the image is then recorded. The image is recorded in the current image area of the read/write memory with the aid of a plurality of pixels, which can have either grey scale values from white to black, or colour values. The user can then choose whether or not he wishes to keep the current image. If the user decides to keep the image, the process continues along the solid line to step 403, in

which the image is stored in the memory 23. When the image has been stored, the device indicates, in step 404, that it is ready to scan a new image. If the user does not wish to keep the image, the process continues, from
5 step 402, along the dashed line back to step 401 in order for a new image to be scanned.

Alternative Embodiments

The present invention can, of course, be modified within the scope of the appended claims. The lens means
10 may, for example, comprise a lens which is put on like a "cap" on the front of the device in one of the modes.

In the embodiment described above, the device has a single light-sensitive sensor which is used in the first as well as the second mode. As mentioned above, however,
15 the device can alternatively have a sensor for each mode. Fig. 5 shows schematically how the embodiment in Fig. 1 could be modified to have two sensors. In the embodiment in Fig. 5, the device has a second window 2' in the side of the casing, a second light-sensitive sensor 8' with a
20 two-dimensional sensor surface, and a second lens means 7' which can have a variable focus. The electronic circuitry part is the same as in the embodiment in Fig. 1. When adjusting from one mode to the other, an adjustment takes place of which sensor is activated for imaging and
25 an adjustment takes place of from which sensor the electronic circuitry part collects images.

CLAIMS

1. A device for recording information by means of
5 imaging with the aid of at least one light-sensitive
sensor (8) with a two-dimensional sensor surface,
c h a r a c t e r i s e d in that

the device is adjustable between a first mode, in
which the device is adapted to essentially abut against
10 and be passed over a surface for imaging the same by
means of a plurality of images, and a second mode, in
which the device is adapted to reproduce an image of an
object located at a distance.

2. A device according to claim 1, wherein said
15 device is adapted to store information in character-
coded format in the first mode and in image format in
the second mode.

3. A device according to claim 1 or 2, wherein the
device comprises two light-sensitive sensors (8) with a
20 two-dimensional sensor surface, one sensor being used in
the first mode and the other sensor in the second mode.

4. A device according to any one of the preceding
claims, wherein the device has a light-sensitive sensor
which is used both in the first and in the second mode.

25 5. A device according to claim 4, further comprising
a lens means (7) which is adapted to project an image of
the information onto the sensor surface (8) and which is
adjustable between a first position in the first mode and
a second position in the second mode for providing two
30 different foci.

6. A device according to any one of claims 1-4, fur-
ther comprising a lens means (7) which is adapted to pro-
ject an image of the information onto the sensor surface
(8), the position of the lens means (7) being variable
35 for providing a variable focus.

7. A device according to any one of the preceding
claims, wherein said device is adapted to carry out the

imaging of the surface in the first mode in such a way that the images have partially overlapping contents.

8. A device according to claim 7, further comprising a signal-processing unit (20), which is adapted to
5 utilise the partially overlapping contents of the images for putting together the images into a composite image, no recording being required of the position of the device relative to the surface which is being imaged.

9. A device according to claim 8, wherein the
10 signal-processing unit is adapted to carry out the putting-together of the images horizontally as well as vertically.

10. A device according to claim 8 or 9, wherein the signal-processing unit (20) further comprises software
15 for identifying characters in the composite image and for storing the same in the device in character-coded format.

11. A device according to any one of the preceding claims, further comprising a transceiver for wireless communication with an external unit.

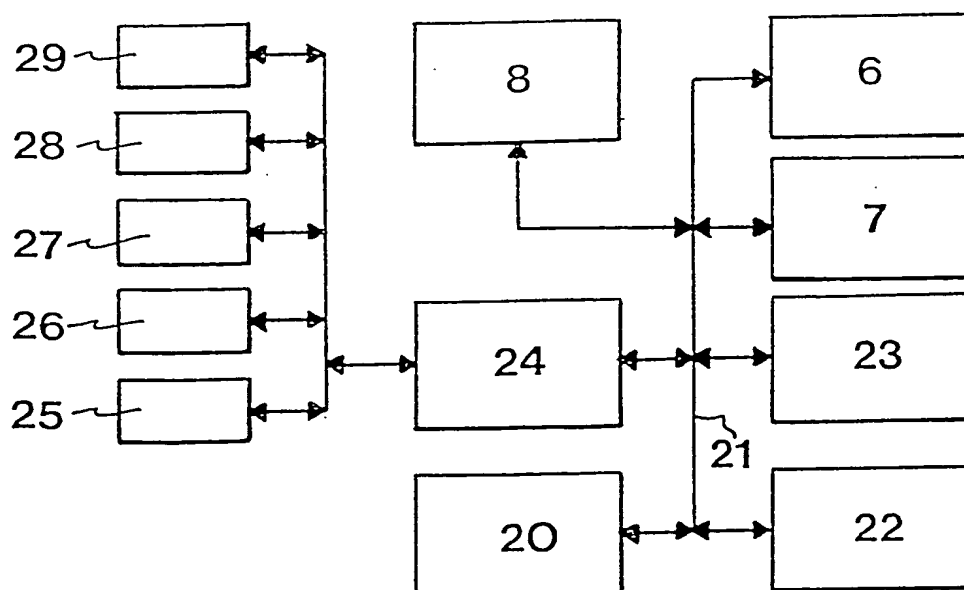
20 12. A device according to any one of the preceding claims, wherein said device is adapted to effect the imaging in the first mode with lower resolution than the imaging in the second mode.

25 13. A device according to any one of the preceding claims, wherein said device is of the hand-held type.

14. A device according to any one of the preceding claims, further comprising identification means (25) for identifying the extent of the imaging.

30 15. A device according to claim 14, wherein the identification means comprises a display (25).

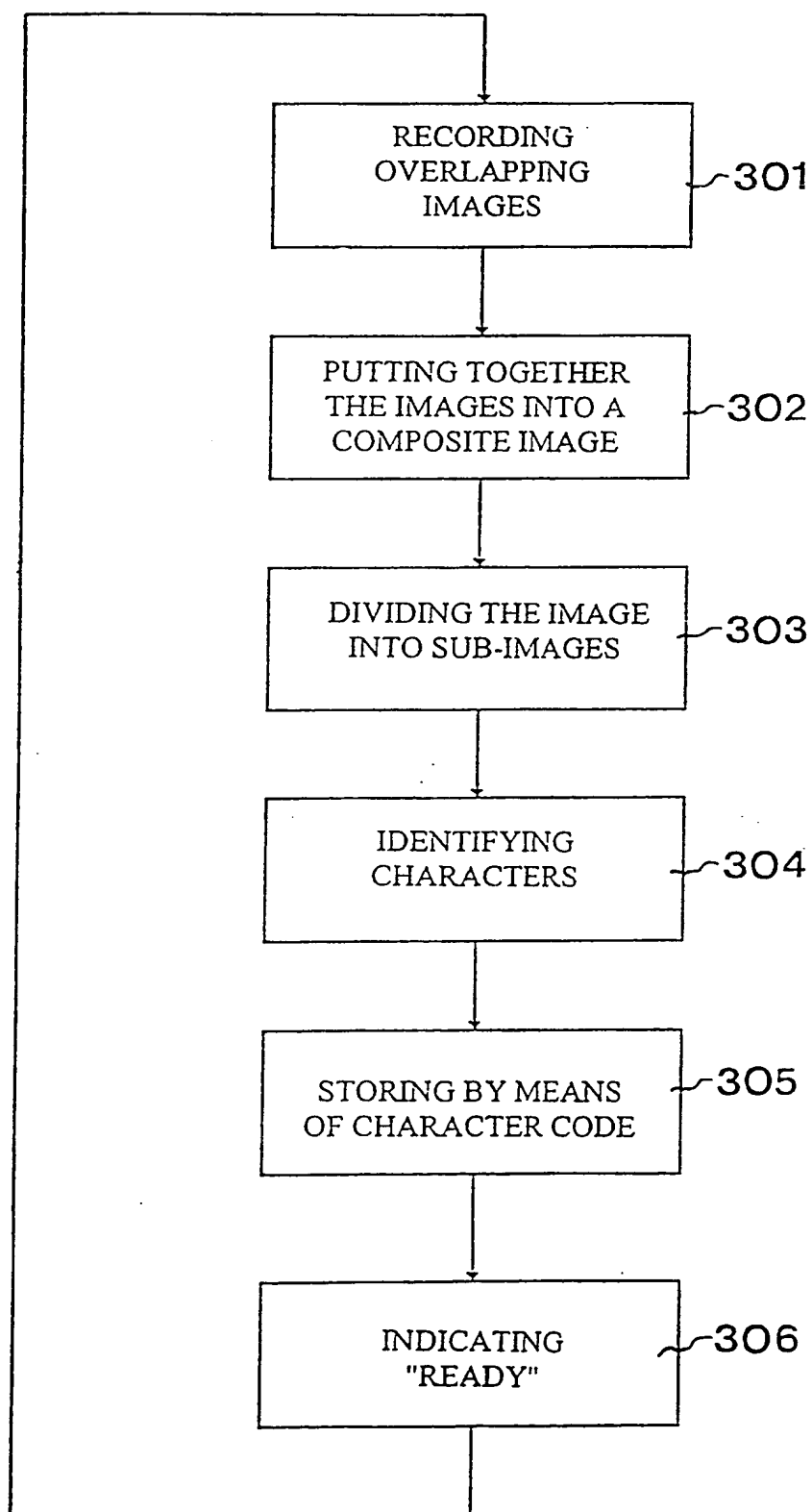
16. A device according to claim 14 or 15, wherein the identification means is adapted to project at least one luminous spot onto the surface or the object to be imaged.



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FIG 3



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FIG 4

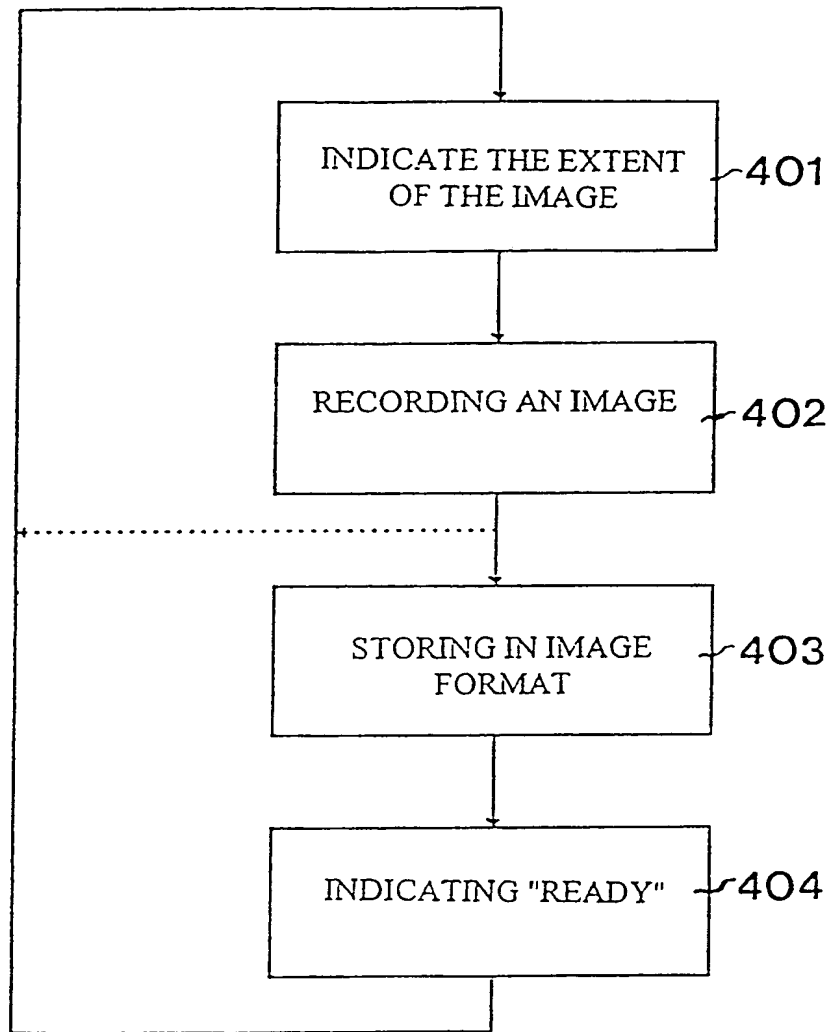
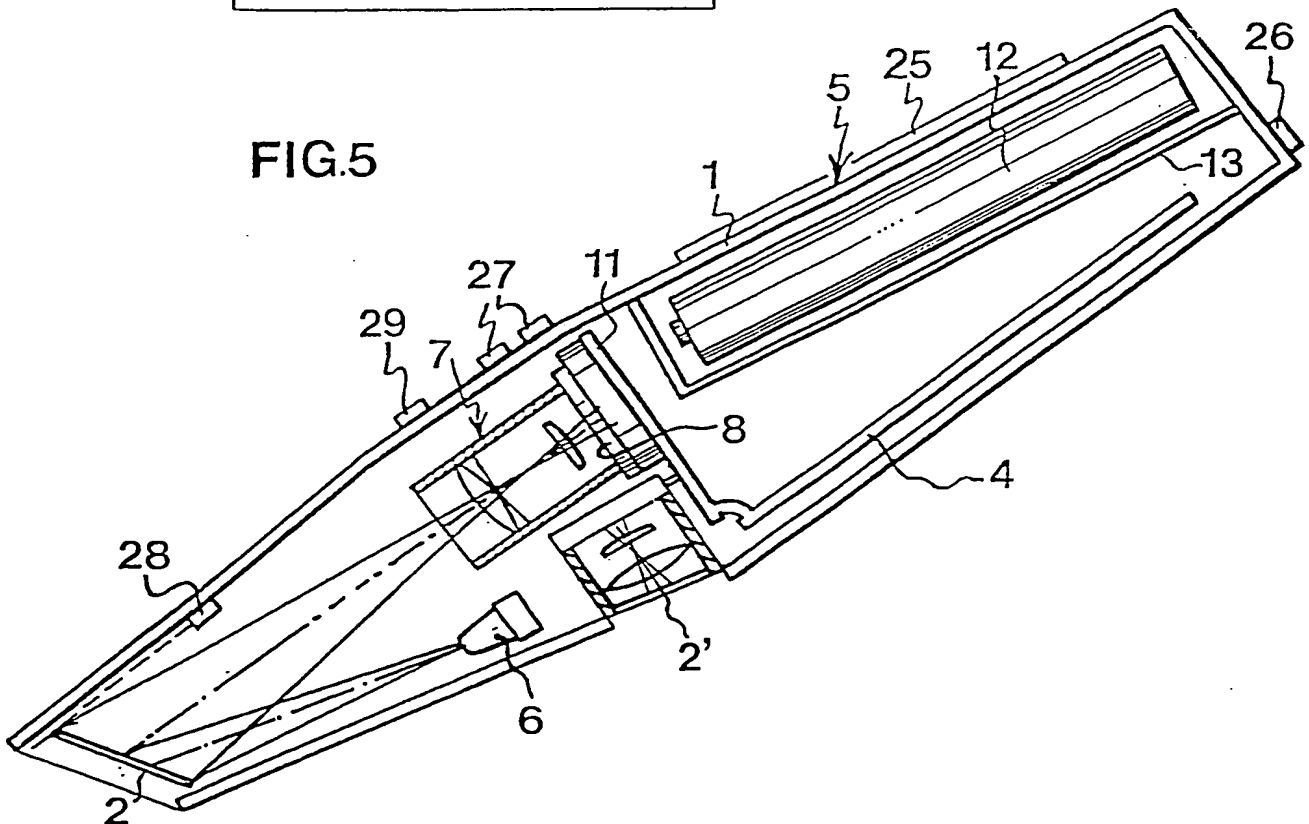


FIG.5



30 YC 11

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| International application No. PCT/SE99/00715 | Priority date (day-month/year) 30 April 1998 (30.04.98) |
| International filing date (day/month/year) 30 April 1999 (30.04.99) | |
| Applicant FÅHRAEUS, Christer | |

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Box No. I TITLE OF INVENTION
DEVICE FOR RECORDING INFORMATION (I) *

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

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Facsimile No.

Teleprinter No.

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State (that is, country) of residence: Sweden

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR FURTHER INVENTOR(S)

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☒ applicant and inventor
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State (that is, country) of residence: Sweden

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☐ Further applicants and/or (further) inventors are indicated on a continuation sheet

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

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| <input checked="" type="checkbox"/> AT Austria +Utility Model | <input checked="" type="checkbox"/> LU Luxembourg |
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| <input checked="" type="checkbox"/> AZ Azerbaijan | <input checked="" type="checkbox"/> MD Republic of Moldova |
| <input checked="" type="checkbox"/> BA Bosnia and Herzegovina | <input checked="" type="checkbox"/> MG Madagascar |
| <input checked="" type="checkbox"/> BB Barbados | <input checked="" type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input checked="" type="checkbox"/> BG Bulgaria | |
| <input checked="" type="checkbox"/> BR Brazil | <input checked="" type="checkbox"/> MN Mongolia |
| <input checked="" type="checkbox"/> BY Belarus | <input checked="" type="checkbox"/> MW Malawi |
| <input checked="" type="checkbox"/> CA Canada | <input checked="" type="checkbox"/> MX Mexico |
| <input checked="" type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input checked="" type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CN China | <input checked="" type="checkbox"/> NZ New Zealand |
| <input checked="" type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input checked="" type="checkbox"/> CZ Czech Republic +Utility Model | <input checked="" type="checkbox"/> PT Portugal |
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| <input checked="" type="checkbox"/> DK Denmark +Utility Model | <input checked="" type="checkbox"/> RU Russian Federation |
| <input checked="" type="checkbox"/> EE Estonia +Utility Model | <input checked="" type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> ES Spain | <input checked="" type="checkbox"/> SE Sweden |
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| <input checked="" type="checkbox"/> GB United Kingdom | <input checked="" type="checkbox"/> SI Slovenia |
| <input checked="" type="checkbox"/> GD Grenada | <input checked="" type="checkbox"/> SK Slovakia +Utility Model |
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| <input checked="" type="checkbox"/> GH Ghana | <input checked="" type="checkbox"/> TJ Tajikistan |
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| <input checked="" type="checkbox"/> IN India | <input checked="" type="checkbox"/> US United States of America |
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| <input checked="" type="checkbox"/> KP Democratic People's Republic of Korea | <input checked="" type="checkbox"/> ZW Zimbabwe |
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| <input checked="" type="checkbox"/> KR Republic of Korea | |
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Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

Sheet No. 3

| Box No. VI PRIORITY CLAIM | | <input type="checkbox"/> Further priority claims are indicated in the Supplement Box. | | |
|---|-------------------------------|---|---|---|
| Filing date of earlier application (day/month/year) | Number of earlier application | Where earlier application is: | | |
| | | national application: country | regional application: * regional Office | international application: receiving Office |
| item (1) 30 April 1998 30.04.98 | 9801520-9 | Sweden | | |
| item (2) 30 June 1998 30.06.98 | 60/091,320 | USA | | |
| item (3) | | | | |

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s): 1

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

| Choice of International Searching Authority (ISA) (If two or more International Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): | Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority): | | |
|--|---|-------------|------------------------------|
| ISA / SE | Date (day/month/year) | Number | Country (or regional Office) |
| | 30 April 1998 | SE 98/00450 | Sweden |

Box No. VIII CHECK LIST; LANGUAGE OF FILING

| | |
|---|--|
| This international application contains the following number of sheets: | This international application is accompanied by the item(s) marked below: |
| request : 3✓ | 1. <input checked="" type="checkbox"/> fee calculation sheet |
| description (excluding sequence listing part) : 14✓ | 2. <input checked="" type="checkbox"/> separate signed power of attorney |
| claims : 2✓ | 3. <input type="checkbox"/> copy of general power of attorney; reference No., if any: |
| abstract : 1✓ | 4. <input type="checkbox"/> statement explaining lack of signature |
| drawings : 3✓ | 5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s): |
| sequence listing part of description : | 6. <input type="checkbox"/> translation of international applications into (language): |
| Total number of sheets : 23 | 7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material |
| Figure of the drawings which should accompany the abstract: 1 | 8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form |
| | 9. <input checked="" type="checkbox"/> other (specify): Copy of Official Action; copy of ITS report |
| | Language of filing of the international application: Swedish |

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).



Cecilia Perklev
Authorised Agent

| For receiving Office use only | | | 2. Drawings: <input checked="" type="checkbox"/> received: <input type="checkbox"/> not received: |
|---|-----------------------------|--|---|
| 1. Date of actual receipt of the Purported international application: | 30 -04- 1999 | | |
| 3. Corrected date of actual receipt due to later but Timely received papers or drawings completing the purported international application: | | | |
| 4. Date of timely receipt of the required Corrections under PCT Article 11(2): | | | |
| 5. International Searching Authority (if two or more are competent): ISA SE | 6. <input type="checkbox"/> | Transmittal of search copy delayed until search fee is paid. | |

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| Form PCT/RO/101 (last sheet) (July 1998; reprint January 1999) | |

See Notes to the request form



ANORDNING FÖR REGISTRERING AV INFORMATION ITekniskt område

Föreliggande uppfinning avser en anordning för registrering av information av det slag som anges i ingressen till efterföljande patentkrav 1.

5 Teknisk bakgrund

På senare tid har användningen av datorer ökat bland många yrkesgrupper med stor geografisk rörlighet. En anledning till detta är att det är möjligt att arbeta mer effektivt om man har direkt tillgång till en stor informationsmängd, samtidigt som man har goda möjligheter att
10 enkelt och effektivt bearbeta ny information.

För detta ändamål har olika typer av bärbara datorer utvecklats. Försedda med lämplig mjukvara skapar dessa typer av datorer stora möjligheter till bearbetning och
15 hantering av information i såväl text- som bildformat.

En nackdel med dessa bärbara datorer är att det ofta är tidskrävande att mata in information via ett tangentbord i förhållande till den tid det tar att behandla informationen när den väl är inmatad i datorn. För att
20 åstadkomma en snabbare och mer effektiv inmatning har man försökt hitta enklare sätt att mata in informationen i datorn. I vissa fall ersätts texten som ska matas in med en sifferkod, vilket exempelvis är fallet vid besiktning av bilar. Detta ställer dock större krav på användaren
25 som måste hålla reda på ett flertal koder, vilket ökar risken för felinmatning.

Bland många yrkesgrupper finns det ett behov i det dagliga arbetet av att på ett enkelt sätt kunna koppla samman bild- och textinformation. Några exempel på detta
30 är olika typer av service- och underhållspersonal som arbetar efter någon typ av protokoll och vill verifiera att en viss åtgärd har utförts, poliser som vid en olycksplats vill samla in såväl bildmaterial som person-



fakta om vittnen m m, forskare och andra personer som sysslar med litteratursökning och vill sammanställa text och bilder ur en mängd olika skrifter.

För att åstadkomma en effektivare inmatning av
5 information i dessa och liknande situationer skulle man kunna använda andra inmatningsenheter, såsom en scanner som registrerar textinformation från en yta när den förs över denna och en digital kamera som tar bilder och lagrar dessa digitalt så att de kan föras över till en dator
10 för bearbetning.

Scannrar finns av såväl fast som portabel typ. Fasta scannrar används företrädesvis vid registrering av hela sidor med tryckt text- och bildinformation, varvid scannern förs över sidan med konstant hastighet. Informationen registreras med en ljuskänslig sensor, som i fasta
15 scannrar oftast utgörs av en linjesensor.

I de flesta av ovanstående situationer önskas dock inte registrering av en hel sida med information, utan istället mer selektiv informationsregistrering, samtidigt
20 som scannern måste vara lätt att bära med sig. Därför är scannrar av handhållen typ betydligt mer intressanta i dessa sammanhang. Sensorerna i dessa scannrar kan antingen vara av linjetyp eller av tvådimensionell typ.

I US 4 949 391 beskrivs t ex en handhållen scanner
25 för registrering av text. Scannern har en tvådimensionell sensor, som registrerar bilder av den underliggande ytan när scannern förflyttas över den.

En annan handhållen scanner beskrivs i US 5 301 243. Denna scanner utnyttjar en linjesensor som registrerar en
30 följd av vertikala "skivor" av tecknen och av mellanrummen mellan dessa när scannern förs över tecknen på substratet. "Skivorna" lagras i scannern som en digital bitmapp. För att en korrekt registrering av tecken ska kunna ske, är scannern försedd med positionsorgan i form av ett
35 hjul som måste vara i kontakt med den underliggande ytan vid registrering av tecknen för att registrera scannerns position relativt ytan.

En nackdel med att samtidigt använda en dator, en scanner och en digital kamera är att utrustningen blir otymplig och att användaren måste hantera ett flertal enheter.

- 5 Det finns alltså ett behov av en lätthanterlig utrustning, med vilken man kan åstadkomma en säker och snabb registrering av selektiv text- och bildinformation i situationer av den ovan beskrivna typen i ett format som gör det enkelt att vid ett senare tillfälle kunna
10 datorbearbeta den.

Sammanfattning av uppfinningen

- Ändamålet med föreliggande uppfinning är att anvisa en lösning på ovanstående problem genom åstadkommande av en förbättrad anordning för registrering av information i
15 text- och bildformat.

Detta ändamål uppnås enligt uppfinningen med en anordning vilken har de särdrag som anges i efterföljande patentkrav 1, med föredragna utföringsformer i efterföljande patentkrav 2-14.

- 20 Uppfinningen bygger på insikten att man utgående från en ljuskänslig sensor med en tvådimensionell sensoryta på ett enkelt sätt kan skapa både en textregistreringsfunktion, dvs "scanner-funktion", och en bildregistreringsfunktion, dvs "kamera-funktion" i en och samma
25 anordning. Närmare bestämt är anordningen omställbar mellan en första mod, i vilken anordningen är anordnad att väsentligen ligga an mot och förflyttas över en yta för avbildning av denna medelst ett flertal bilder, och en andra mod, i vilken anordningen är anordnad att avbilda
30 ett på avstånd beläget objekt.

- En omställning av anordningen kan göras av användaren eller automatiskt av anordningen om denna t ex
detekterar att avståndet till ett objekt inom dess synfält ändrar sig mer än ett förutbestämt värde. Omställ-
35 ningen innebär att anordningen på något sätt anpassas, t ex fysiskt eller mjukvarumässigt, så att den blir lämpad att användas i den aktuella moden.



Den första moden, eller "scanner-moden", är avsedd för registrering av information som befinner sig på en yta som anordningen kan föras över. Ytan behöver inte vara plan. Det räcker att den är så jämn att anordningen
5 kan förflyttas i kontakt med ytan eller omedelbart intill denna. Informationen, som kan sägas vara "tvådimensionell" eftersom den finns på en yta, kan utgöras av teckensekvenser, exempelvis ett eller flera ord eller en eller flera meningar som väljs i en längre text. Tecknen
10 kan vara bokstäver, siffror, eller andra skrivtecken eller symboler. Den lagras företrädesvis i teckenkodat format. Informationen kan emellertid också utgöras av bildinformation som scannas in genom att anordningen förs över ytan och ett flertal bilder av bildinformationen
15 registreras.

Den andra moden används företrädesvis för registrering av "tredimensionell" information, dvs när man behöver ta bilder av föremål. I denna mod tas företrädesvis enskilda bilder som lagras i bildformat. Denna mod kan
20 givetvis också användas för att ta bilder på avstånd av ytor, vilka bilder lagras i bildformat.

En och samma sensor kan användas i både den första och den andra moden, men det är även tänkbart att använda en sensor för vardera moden. I det senare fallet skulle
25 omställningen innebära att strålgången i anordningen ändras så att avbildningen sker med hjälp av den ena sensorn i den första moden och med hjälp av den andra sensorn i den andra moden. Strålgången kan ändras genom omställning av en eller flera komponenter i anordningen. Alternativt
30 kan en första öppning med en första fast strålgång användas i den första moden och en andra öppning med en andra fast strålgång användas i den andra moden. Omställning mellan moderna innefattar då en omställning av vilken sensor som aktiveras för avbildning.

35 I detta sammanhang skall påpekas att med tvådimensionell sensoryta menas här att sensorytan skall kunna



avbilda en yta med en matris av bildpunkter så att bilder med överlappande innehåll kan registreras.

I den första moden registreras företrädesvis bilder med delvis överlappande innehåll. Det överlappande innehåll
5 hållet används för att passa ihop bilderna till en hoppassad bild, i vilken det inte finns några dupliceringar av innehållet. Hoppassningen sker lämpligen med hjälp av en signalbehandlingsenhet som t ex kan innehålla programvara för detta ändamål. Genom att det överlappande innehåll
10 hållet används för att passa ihop bilderna behöver anordningen inte innehålla några organ, t ex hjul, för att registrera anordningens position relativt den yta som avbildas eller för att mäta avståndet mellan bilderna. Anordningen kan också flyttas med varierande hastighet
15 och bilderna ändå passas ihop till en hoppassad bild.

Hoppassningen av bilderna sker företrädesvis i såväl horisontell led som i vertikal led. Detta medför den fördelen att anordningen kan hållas i olika vinklar och tom
vridas under det att den förs över ytan och ändå kan bilderna passas ihop så väl att tecknen kan identifieras och
20 OCR-behandlas i den hoppassade bilden.

Signalbehandlingsenheten innefattar företrädesvis programvara för identifiering av tecken i den hoppassade bilden och lagring av dessa i anordningen i teckenkodat
25 format, företrädesvis ASCII-kod. Teckenidentifieringen görs med fördel med hjälp av ett neuralt nät. Lagringen i teckenkodat format gör att betydligt mindre minnesutrymme krävs än för motsvarande informationsmängd lagrad exempelvis som en bitmappsbild.

30 För att projicera en tydlig bild på sensorytan av informationen som skall registreras, dvs den yta över vilken anordningen förflyttas i den första moden, eller av det på avstånd belägna objektet i den andra moden, innefattar anordningen företrädesvis minst ett linsorgan,
35 som är flyttbart mellan ett första läge i den första moden och ett andra läge i den andra moden. Härigenom åstadkommes två fokus för anordningen, dvs två olika



avbildningsavstånd som båda ger en skarp bild på sensorytan. Det ena används företrädesvis i den första moden där ett objekt befinner sig intill anordningen och det andra företrädesvis används i den andra moden där ett objekt befinner sig på avstånd från anordningen. Det andra läget kan lämpligen medge avbildning av objekt på avstånd mellan 0,5 m och oändligheten. De olika fokusen gör det möjligt att avbilda ytor eller föremål på olika avstånd från anordningen. Linsorganet kan utgöras av en eller flera linser som är flyttbara. Anordningen kan innehålla en eller flera fasta linser utöver den eller de flyttbara linserna. Denna utföringsform är i första hand avsedd för det fall då anordningen har en enda ljuskänslig sensor som är gemensam för båda moderna.

15 I en ytterligare utföringsform innefattar anordningen ett linsorgan vars läge är varierbart för åstadkommande av ett varierbart fokus eller en autofokusfunktion. Härigenom möjliggörs skarp avbildning av ett objekt som befinner sig på ett godtyckligt avstånd.

20 I en fördelaktig utföringsform är anordningen vidare anordnad att åstadkomma avbildningen i den första moden med en lägre upplösning än avbildningen i den andra moden. Detta kan exempelvis uppnås i den första moden genom att man passiverar endel av sensorsns sensorelement eller genom att man bara sparar en del av de sensorvärden som registreras av sensorn eller genom att man i den fortsatta behandlingen av bilderna, såsom vid hoppassningen, bara utnyttjar en del av de sparade sensorvärdena. Fördelen med denna utföringsform är att man kan 30 åstadkomma en snabbare, men ändå säker, hoppassning av bilderna i den första moden om dessa har lägre upplösning.

Anordningen innefattar vidare med fördel en sändtagare för trådlös kommunikation med en extern enhet. 35 Härigenom kan information föras över mellan anordningen och exempelvis en extern dator. Sändtagaren kan vara en



IR-sändtagare, en mobilradiosändtagare eller någon annan lämplig sändtagare.

För att anordningen ska vara lätthanterlig i alla typer av registreringssituationer är den lämpligen av handhållen typ. Därmed utökas också användningsområdet kraftigt.

I en föredragen utföringsform innefattar anordningen även identifieringsorgan för identifiering av omfattningen av avbildningen. Identifieringsorganet kan till exempel utgöras av en display som är monterad på anordningen, eller av en eller flera ljuspunkter som projiceras från anordningen på objektet för att definiera avbildningens omfattning. Genom att användaren får en uppfattning om hur bilden av objektet kommer att se ut efter registrering ökar chanserna för ett korrekt avbildningsresultat väsentligt

Kort beskrivning av ritningarna

Uppfinningen kommer att beskrivas närmare i det följande under hänvisning till bifogade schematiska ritningar som i exemplifierande syfte visar en för närvarande föredragen utföringsform av uppfinningen.

Fig 1 visar schematiskt en första utföringsform av en anordning enligt uppfinningen.

Fig 2 är ett blockschema över elektroniken i en utföringsform av en anordning enligt uppfinningen.

Fig 3 är ett flödesschema som visar hur anordningen är avsedd att fungera i den första moden.

Fig 4 är ett flödesschema som visar hur anordningen är avsedd att fungera i den andra moden.

Fig 5 visar schematiskt en andra utföringsform av en anordning enligt uppfinningen.

Beskrivning av en föredragen utföringsform

Anordningens uppbyggnad

I den i fig 1 visade utföringsformen av anordningen enligt uppfinningen har denna ett hölje 1 med ungefär samma form som en konventionell överstrykningspenna. Höljets ena kortände har ett fönster 2.



I anordningens första mod, den s k scanningmoden, är
fönstret 2 avsett att ligga an mot eller hållas omedel-
bart intill en yta som man önskar avbilda. Denna yta kan
exempelvis utgöras av ett papper från vilket man önskar
5 registrera text. I anordningens andra mod, den s k
kameramoden, är fönstret avsett att riktas mot ett på
avstånd beläget objekt som man önskar avbilda.

Fönstrets 2 dimensioner avgör storleken av den yta
som kan avbildas i den första moden. I den andra moden
10 utgör fönstrets 2 dimensioner endast en delfaktor vid
avgörandet beträffande vilka objekt som kan registreras.
En annan, lika viktig delfaktor i den andra moden är
avståndet till det objekt som användaren önskar avbilda
med anordningen.

15 Fönstret 2 bildar en spetsig vinkel med anordningens
längdaxel, så att användaren i den första moden styrs
till att hålla anordningen i en förutbestämd vinkel mot
den underliggande ytan. Fönstret 2 är vidare något indra-
get i höljet 1 så att det inte slits mot den underlig-
20 gande ytan då anordningen används i den första moden.

Höljet 1 inrymmer i huvudsak en optikdel 3, en elek-
tronikdel 4 och en strömförsörjning 5.

Optikdelen 3 innefattar en lysdiod 6, ett flyttbart
linssystem 7 och en ljuskänslig sensor 8 som utgör gräns-
25 snitt mot elektronikdelen 4.

Lysdioden 6 används företrädesvis i den första moden
där den har till uppgift att belysa den del av ytan som
för tillfället finns under fönstret. En diffusor 9 är
monterad framför lysdioden 6 för att sprida ljuset. I den
30 andra moden belyses objektet som avbildas företrädesvis
med andra externa ljuskällor i objektets omgivning.

Linssystemets 7 uppgift är att projicera en bild av
den yta som befinner sig under fönstret 2, eller det
objekt som befinner sig inom fönstrets synfält på den
35 ljuskänsliga sensorn 8 på ett så korrekt sätt som möj-
ligt. Vid omställningen mellan de båda moderna flyttas
linssystemet 7 mellan två lägen, så att två olika fokus



åstadkoms. I fig 1 visas linssystemet 7 i det första läget A. Det andra läget B är symboliskt markerat som en streckad förlängning av linssystemet. Flyttningen av linssystemet 7 kan göras på samma sätt som i en kamera med två fokus. Linssystemet 7 förminskar vid behov även bilden, så att den ryms på sensorns 8 ljuskänsliga yta.

Den ljuskänsliga sensorn 8 utgörs i detta exempel av en tvådimensionell, kvadratisk CCD-enhet (CCD = charge coupled device, laddningskopplad anordning) med inbyggd A/D-omvandlare. Sådana sensorer är kommersiellt tillgängliga. Sensorn 8 är här monterad i liten vinkel mot fönstret 2 och på ett eget kretskort 11.

Strömförsörjningen till anordningen erhålls från ett batteri 12 som är monterat i ett separat fack 13 i höljet.

I blockschemat i Fig 2 visas elektronikdelen 4 schematiskt. Den innefattar en processor 20, vilken via en buss 21 är kopplad till ett läsminne 22, i vilket processorns program är lagrade, till ett skriv-läsminne 23, vilket utgör processorns arbetsminne och i vilket bilderna från sensorn liksom de i den första moden identifierade och tolkade tecknen lagras, till en styrlogikenhet 24, samt till sensorn 8, linssystemet 7 och lysdioden 6.

Styrlogikenheten 24 är i sin tur kopplad till ett antal periferienheter, som innefattar en display 25, som är monterad i höljet, en IR-sändtagare 26 för överföring av information till/från en extern dator, knappar 27, medelst vilka användaren kan styra anordningen, en spårlysdiod 28, som sänder ut en ljusstråle, vilken gör det lättare för användaren att följa texten, samt en indikeringsanordning 29, t ex ett par lysdioder, som indikerar i vilken mod anordningen befinner sig och om registrering sker eller ej. I styrlogikenheten 24 genereras styrsignaler till minnena, sensorn och periferienheterna. Styrlogiken hanterar även generering och prioritering av avbrott till processorn. Knapparna 27, IR-sändtagaren 26, displayen 25 och spårlysdioden 28, och lysdioden 6 nås

genom att processorn skriver och läser i registret i styrlogikenheten. Knapparna 27 genererar avbrott till processorn 20 när de aktiveras.

Anordningens funktion i den första moden

5 Anordningen fungerar i den första moden enligt följande. Antag att en användare vill registrera text från ett papper. Han håller då anordningen mot pappret på det ställe han vill börja registrera en sekvens av tecken. Han trycker på en knapp 27 för aktivering av anordningen
10 och drar denna över den text han vill registrera, varvid han följer texten på det sätt som man gör när man läser texten. Spårlysdioden 28 utsänder en ljusstråle som underlättar radföljningen. När användaren aktiverar anordningen, styr processorn 20 lysdioden 6 till att börja
15 stroboskopera med en förutbestämd frekvens av 25 Hz, varvid sensorn registrerar bilder med delvis överlappande innehåll som lagras i läs-skrivminnet 23. Text som är lagrad i form av bilder kräver emellertid mycket minnesutrymme. För att spara minnesutrymme i denna mod identifieras därför tecknen i bilderna och lagras med hjälp av
20 ASCII-kod. När användaren har fört anordningen över den valda texten eller kommit till slutet av en rad lyfter han anordningen från papperet och släpper aktiveringsknappen, varvid processorn 20 stänger av lysdioden 6. När
25 den valda texten har registrerats, kan användaren styra anordningen till att visa den registrerade texten på displayen 25 eller till att föra över texten till en extern dator via IR-sändtagaren 26. Möjligheten att visa den inlästa informationen direkt på skärmen har visat sig
30 vara mycket väsentlig eftersom en användare ofta vill verifiera att rätt information har lästs in.

I flödesschemat i fig 3 visas hur anordningen är anordnad att arbeta i den första moden. I steg 301 registreras bilder med överlappande innehåll med hjälp av
35 ovan beskrivna anordning och lagras i en nubildsarea i läs-skrivminnet 23. Bilderna lagras just som bilder, dvs



med hjälp av ett flertal bildpunkter, som var och en har ett gråskalevärde i ett intervall från vitt till svart.

Så snart en bild är lagrad i nubbildsarean påbörjas lämpligen en hoppassning av bilden med den närmast föregående bilden, steg 302, om sådan finnes. Om det inte finns någon föregående bild, förs den aktuella bilden direkt in i en radbildsarea i läs-skrivminnet.

För att bestämma hur den aktuella bilden skall passas ihop med den föregående bilden så att bästa överensstämmelse fås mellan innehållet i bilderna, undersöks varje tänkbar överlappsposition mellan bilderna, sett på bildpunktsnivå, och bestäms ett överlappsintervall enligt följande:

1) För varje överlappande bildpunktssumma summeras gråskalevärdena för de båda ingående bildpunkterna om dessa inte är vita. En sådan bildpunktssumma i vilken ingen av bildpunkterna är vita betecknas en plusposition.

2) Gråskalesummorna för alla pluspositioner summeras.

3) Grannarna till varje bildpunktssumma undersöks. Om en överlappande bildpunktssumma inte är grann till någon plusposition och består av en bildpunkt som är vit och en bildpunktssumma som inte är vit subtraheras gråskalevärdet för den icke-vita bildpunkten, eventuellt multiplicerat med en konstant, från summan under punkt 2).

4) Den överlappsposition som ger det högsta överlappsintervall enligt ovan väljs. I den resulterande hoppassade bilden används medelvärdet av gråskalevärdet för de överlappande bildpunkterna. På detta sätt kan brus undertryckas i överlappsområdet. Hoppassningen sker alltså i både vertikal och horisontell led. Om det detekteras att bilderna vid hoppassningen inte hamnar på en horisontell linje, injusteras den hoppassade bilden lämpligen så att den blir horisontell, exempelvis genom vridning av den hoppassade bilden.



I vår svenska patentansökan nr 9704924-1 och motsvarande amerikanska ansökan nr 024 641 beskrivs ett alternativt sätt att matcha bilderna för att hitta den bästa överlappningpositionen. Innehållet i dessa ansökn
5 ningar inkorporeras härmed i denna ansökan.

Den hoppassade bilden växer fram efterhand i radbildsarean i läs-skrivminnet. Det föredras att radbildsarean är så stor att den kan lagra en A4-rad av normal maskinskriven text.

10 I steg 303 delar processorns 20 programvara in den hoppassade bilden i radbildsminnesarean i delbilder som var och en innehåller endast ett tecken. Syftet med detta är att skapa insignaler till en neuronnätprogramvara som skall tolka tecknen. Indelningen görs genom att för varje
15 bildpunktsrad och varje bildpunktskolumn i den hela bilden summera gråskalevärdena för bildpunkterna. Genom att studera de lokala intensitetsminimumen för de erhållna radsummorna och kolumnsummorna kan gränslinjer för varje teckens utsträckning i bilden bestämmas.

20 I steg 304 tolkas sedan varje tecken i den hoppassade bilden av den avbildade teckensekvensen. Gråskalevärdena för de bildpunkter som tillsammans utgör en delbild som innehåller endast ett tecken matas då som insignaler till ett neuralt nät. Varje utgång från det neurala
25 nätet representerar ett tecken som nätet kan identifiera. Den utgång från nätet som har den högsta utsignalen väljs och det sålunda valda tecknet lagras i steg 305 med något förutbestämt teckenkodformat, exempelvis ASCII-kod, i läs-och-skrivminnet 23 i en minnesarea för tolkade
30 tecken. När teckenidentifieringen och lagringen i teckenkodat format är klar, aktiverar processorn indikeringsanordningen 29 för att informera användaren om att den är redo för registrering av en ny teckensekvens, steg 306. Därefter går den tillbaka till steg 301.

35 I den första moden genomförs alltså de ovan beskrivna stegen av processorn 20 med hjälp av de tillhörande enheterna och lämplig programvara. Sådana program kan



åstadkommas av fackmannen med hjälp av anvisningarna
ovan. Teckenigenkänningen genomförs med hjälp av neuron-
nätprogramvara, som tränas på lämpligt sätt. Neuronnät-
programvara finns kommersiellt tillgänglig från exempel-
5 vis MATLAB Neural Network Toolbox, The MathWorks, Inc. 24
Prime Park Way, Natick, MA 01760, USA.

Omställning av anordningen mellan de båda moderna

Antag att användaren nu vill komplettera den inlästa
texten med en bild på ett föremål. Han indikerar då detta
10 genom att trycka på knappen 27. Linssystemet förflyttas
då till läget B. Förflyttningen medför att fokus för an-
ordningen ändras så att en tydlig bild av ett föremål på
avstånd kan projiceras på sensorns 8 ljuskänsliga yta.

Anordningens funktion i den andra moden

15 Anordningen fungerar i den andra moden enligt följande.
Användaren riktar anordningens fönster mot det på
avstånd belägna föremålet som han önskar avbilda. På
anordningens display 25 kan användaren se den bild som
kommer att registreras. När användaren är nöjd med bil-
20 dens utseende trycker han på en knapp 27 för aktivering
av anordningen som då registrerar en bild av objektet och
lagrar den i bildformat i minnet 22. När bilden av objek-
tet är registrerad kan användaren styra anordningen an-
tingen till att visa den registrerade bilden på displayen
25 eller till att föra över bilden till en extern dator
via IR-sändtagaren 26. Den registrerade bilden kan sedan
kompletteras med ytterligare textinformation, genom att
användaren ställer om anordningen till den första moden
och registrerar text eller andra tecken. Den registrerade
30 text- och bildinformationen kan sedan antingen visas på
anordningens display 25 eller på en extern dator.

I flödesschemat i fig 4 visas hur anordningen är
anordnad att arbeta i den andra moden. I steg 401 indike-
ras bildens omfång på anordningens display 25. När använ-
35 daren är nöjd med bildens utseende trycker han på knappen
27 och i steg 402 registreras då bilden. Bilden registre-
ras i nubildsarean i läs-och-skrivminnet med hjälp av ett



flertal bildpunkter, vilka antingen kan ha gråskalevärden från vitt till svart, eller ha färgvärden. Användaren kan nu välja om han vill behålla den aktuella bilden, eller ej. Om användaren bestämmer sig för att behålla bilden, 5 fortsätter processen längs den heldragna linjen till steg 403, i vilket bilden lagras i minnet 23. När bilden är lagrad indikeras i steg 404 att anordningen är klar för inläsning av en ny bild. Om användaren inte vill behålla bilden fortsätter processen efter steg 402 längs den 10 streckade linjen tillbaka till steg 401 för inläsning av en ny bild.

Alternativa utföringsformer

Föreliggande uppfinning kan naturligtvis modifieras inom ramen för de efterföljande patentkraven. Linsorganet 15 kan t ex utgöras av en lins som sätts på som en "mössa" framme på anordningen i den ena moden.

I ovan beskrivna utföringsform har anordningen en enda ljuskänslig sensor som används i både den första och den andra moden. Såsom nämnts kan emellertid anordningen 20 alternativt ha en sensor för vardera moden. I fig 5 visas schematiskt hur utföringsformen i fig 1 skulle kunna modifieras till att ha två sensorer. I utföringsformen i fig 5 har anordningen ett andra fönster 2' i sidan av höljet, en andra ljuskänslig sensor 8' med två-dimensio- 25 nell sensoryta, och ett andra linsorgan 7' som kan ha varierbart fokus. Elektronikdelen är densamma som i utföringsformen i fig 1. Vid omställning från den ena till den andra moden, sker en omställning av vilken sensor som är aktiverad för avbildning och en omställning av från 30 vilken sensor elektronikdelen hämtar bilder.



PATENTKRAV

1. Anordning för registrering av information genom
5 avbildning med hjälp av minst en ljuskänslig sensor (8)
med en tvådimensionell sensoryta,
k ä n n e t e c k n a d av

att anordningen är omställbar mellan en första mod,
i vilken anordningen är anordnad att väsentligen ligga an
10 mot och förflyttas över en yta för avbildning av denna
medelst ett flertal bilder, och en andra mod, i vilken
anordningen är anordnad att avbilda ett på avstånd belä-
get objekt.

2. Anordning enligt krav 1, varvid anordningen är
15 anordnad att i den första moden lagra informationen i
teckenkodat format och i den andra moden i bildformat.

3. Anordning enligt krav 1 eller 2, varvid anord-
ningen innefattar två ljuskänsliga sensorer (8) med två-
dimensionell sensoryta, varvid den ena sensorn används i
20 den första moden och den andra sensorn i den andra moden.

4. Anordning enligt något av föregående krav, varvid
anordningen har en ljuskänslig sensor som används i både
den första och den andra moden.

5. Anordning enligt krav 4, vidare innefattande ett
25 linsorgan (7) som är anordnat att projicera en bild av
informationen på sensorytan (8) och som är flyttbart
mellan ett första läge i den första moden och ett andra
läge i den andra moden för åstadkommande av två olika
fokus.

30 6. Anordning enligt något av krav 1-4, vidare inne-
fattande ett linsorgan (7) som är anordnat att projicera
en bild av informationen på sensorytan (8), varvid lins-
organets (7) läge är varierbart för åstadkommande av ett
varierbart fokus.

35 7. Anordning enligt något av föregående krav, varvid
anordningen är anordnad att i den första moden utföra

avbildningen av ytan på så sätt att bilderna har delvis överlappande innehåll.

8. Anordning enligt krav 7, vidare innefattande en signalbehandlingsenhet (20), som är anordnad att utnyttja
5 det delvis överlappande innehållet i bilderna för hoppassning av bilderna till en hoppassad bild, varvid ingen registrering av anordningens position relativt den yta som avbildas krävs.

9. Anordning enligt krav 8, varvid signalbehand-
10 lingsenheten är anordnad att utföra hoppassningen av bilderna i såväl horisontell led som i vertikal led.

10. Anordning enligt krav 8 eller 9, varvid signal-
behandlingsenheten (20) vidare innefattar programvara för
15 identifiering av tecken i den hoppassade bilden och lagring av dessa i anordningen i teckenkodat format.

11. Anordning enligt något av föregående krav, vidare innefattande en sändtagare för trådlös kommunikation med en extern enhet.

12. Anordning enligt något av föregående krav, var-
20 vid anordningen är anordnad att åstadkomma avbildningen i den första moden med lägre upplösning än avbildningen i den andra moden.

13. Anordning enligt något av föregående krav, var-
vid anordningen är av handhållen typ.

25 14. Anordning enligt något av föregående krav, vidare innefattande identifieringsorgan (25) för identifiering av omfattningen av avbildningen.

15. Anordning enligt krav 14, varvid identifieringsorganet utgörs av en display (25).

30 16. Anordning enligt krav 14 eller 15, varvid identifieringsorganet är anordnat att projicera minst en ljuspunkt på ytan eller objektet som skall avbildas.



SAMMANDRAG

En anordning för registrering av information har
5 minst en ljuskänslig sensor (8) med en tvådimensionell
sensoryta. Anordningen är omställbar mellan en första mod
och en andra mod. I den första moden är anordningen an-
ordnad att väsentligen ligga an mot och förflyttas över
en yta för avbildning av denna medelst ett flertal bil-
10 der. I den andra moden är anordningen anordnad att av-
bilda ett på avstånd beläget objekt.

15

20

25

30 Publiceringsbild = Fig 1



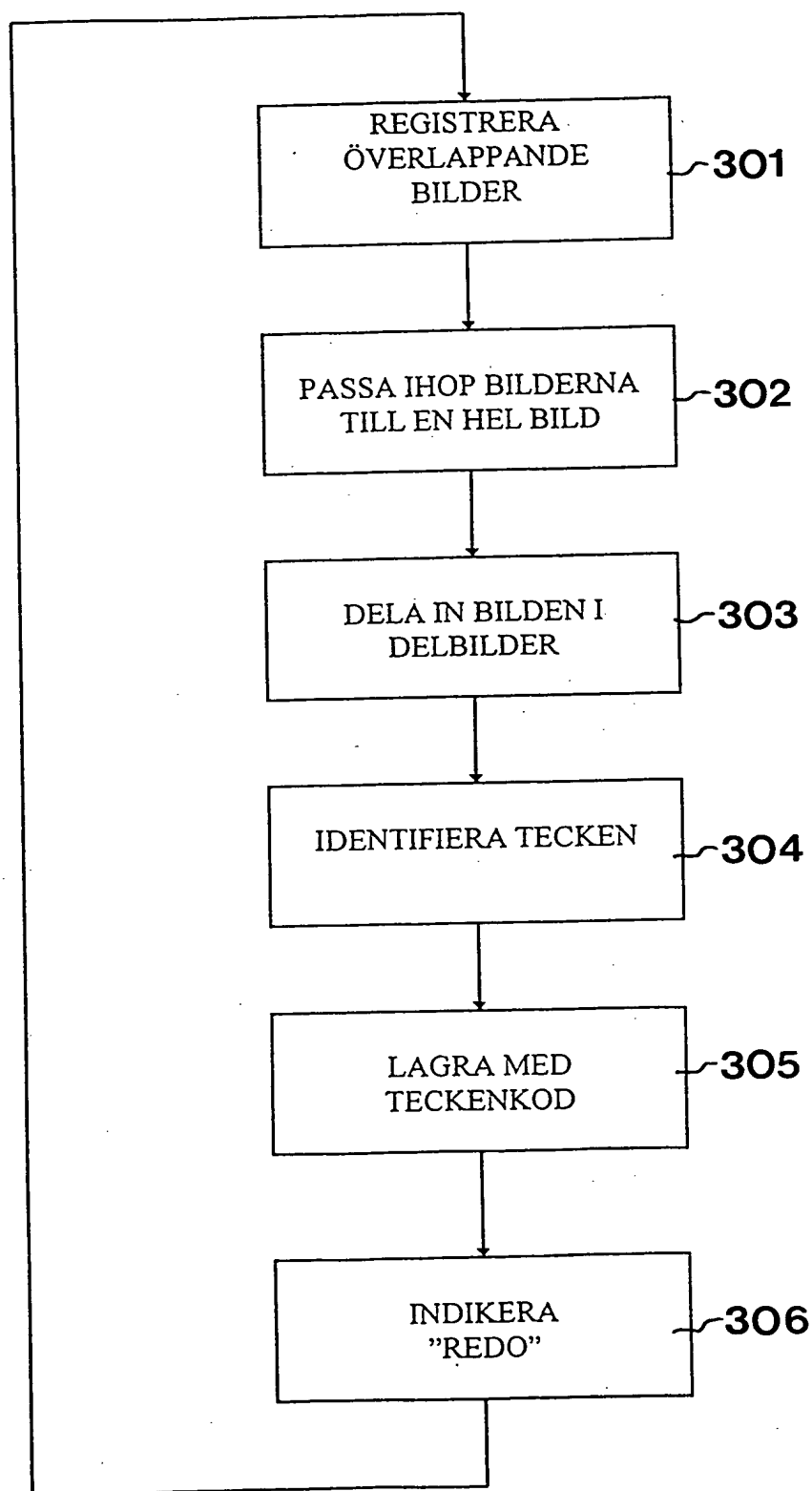
[illegible]

The diagram shows a central block 24 connected to five input blocks (25-29) on the left and three output blocks (20, 22, 23) on the right. A vertical line with a bracket labeled 21 connects the output blocks. A block labeled 8 is also connected to the system.



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FIG3



3/3

FIG 4

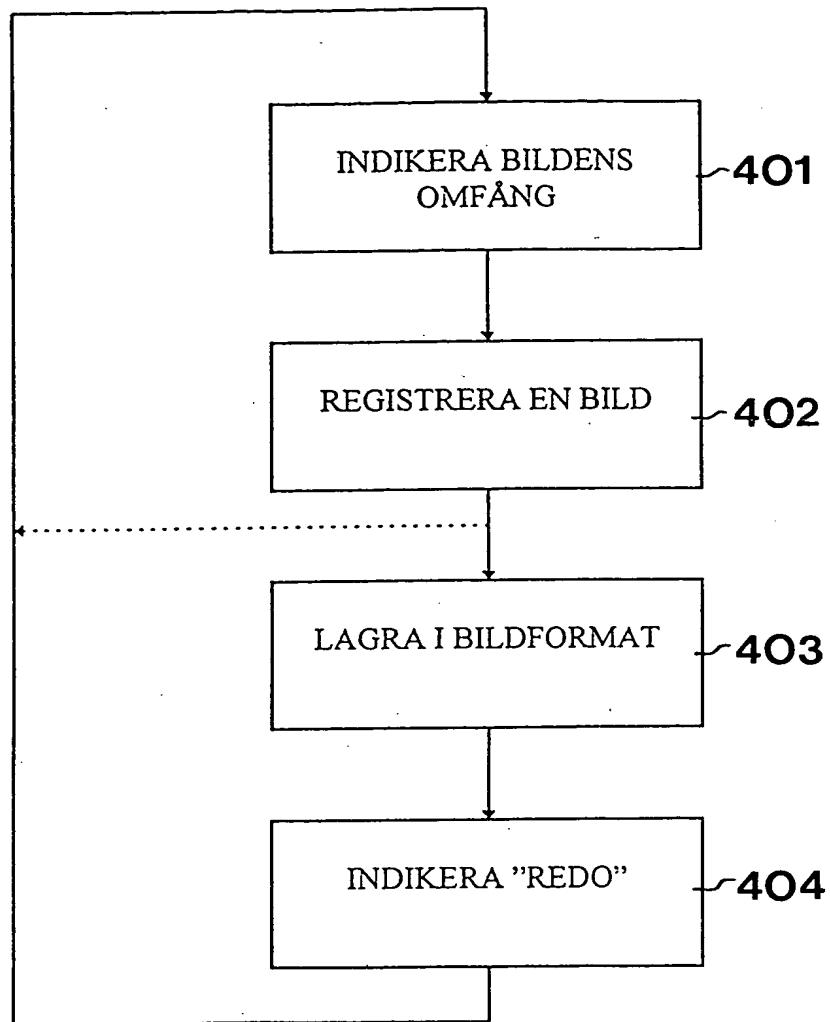


FIG.5

